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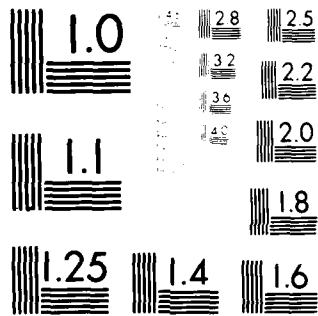
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Risk Taking as Motivation for
Volunteering for a Hazardous Experiment

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Abstract

Army male enlisted personnel were tested in two experiments to assess the psychological correlates of volunteering for a hazardous experiment, (Experiment 1) and a riskless, psychological experiment (Experiment 2). Subjects were given a biographical and personal habit questionnaire, IPAT Anxiety Scale, Rotter's Locus of Control Scale, and Torrance and Ziller's Life Experience Inventory. Results from Experiment 1 indicated that volunteers were significantly less anxious ($p < .01$), and more willing to take risks ($p < .01$) than were nonvolunteers. Noncommissioned officers ($p < .05$), smokers ($p < .05$), later-born children ($p < .05$), and children of lower socioeconomic class parents ($p < .05$) were significantly overrepresented among the volunteers, and the hazardous nature of the experiment appears to have determined their characteristics. In Experiment 2, the only finding was that children of mothers who had attended college ($p < .01$) were overrepresented. Results are in agreement with findings, using college students, that volunteer samples differ significantly from nonvolunteer samples, and that results vary as a function of situational variables. The study indicates that the generalizability of experimental results have important limitations.



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Risk Taking as Motivation for Volunteering for a Hazardous Experiment

This decade has witnessed increasing restrictions through federal regulations on the use of subjects in scientific research, especially in research which is federally funded or sponsored. As a result of these provisions, researchers have given increased attention to the trait differences between volunteers and nonvolunteers, which has always been a popular topic of research in its own right. This research has centered specifically on the implication of such differences on the ability to generalize such findings to the general population. To further complicate the issue, these differences appear to vary as a function of other variables particular to a given experiment, such as type of experiment, type of subject, method of recruitment, and others. An excellent review of the extensive literature on volunteering is available (see Rosenthal & Rosnow, 1969; 1975); therefore, only literature relevant to the present experiment will be discussed.

EXPERIMENT I

The purpose of the present experiment was to determine the psychological characteristics of volunteers for an experiment involving personal risk, as hypothesized below, and in which the suppressive effects of artillery and mortar fire were simulated by the use of dynamite.

Risk Taking

In this study, because of its hazardous nature, volunteers were predicted to be greater risk takers than nonvolunteers, based on the risk-taking trait hypothesis of Torrance and Ziller (Note 1), which states that risk takers are self-confident, physically and socially adequate, and self-expressive. Torrance and Ziller have devised a risk-taking scale which is based on the life influence of individuals. They found that risk takers earlier learned to drive a car, earlier played with snakes, smoked, drank, and had sexual intercourse. They more frequently fought, took dares, and participated in rough sports and physical activities such as hunting and mountain climbing. Risk takers were also more socially aggressive, enjoyed competition, and participated in dangerous activities (e.g., auto racing, motorcycling). Additionally, research on individuals in dangerous occupations indicates that they are greater risk takers than are controls (e.g., Biersner, 1971; Fenz & Brown, 1968).

Anxiety

Many studies have found volunteers to be more anxious (e.g., Rosen, 1951; Schubert, 1964), whereas others (e.g., Myers, Murphy, Smith, & Goffard, 1966; Philip & McCulloch, 1970; Scheier, 1959) reported volunteers to be less anxious; some have found no differences (Zuckerman, Schultz & Hopkins, 1967). Rosenthal and Rosnow (1969) hypothesize that volunteers for more threatening experiments are less anxious than nonvolunteers, whereas volunteers for less threatening experiments are more anxious than nonvolunteers. The results of Philip and McCulloch, with male subjects, indicates that prospective subjects having recently undergone stress, would be less willing to undergo further stress. Therefore, it was predicted that volunteers would be less anxious than nonvolunteers since the experiment was hazardous.

Birth Order

Volunteers are more likely to be firstborn according to some studies (Altus, 1966; Capra & Dittes, 1962), although others have found no such relationship (Zuckerman, Schultz, & Hopkins, 1967; Myers et al. 1966). MacDonald (1972) suggests that firstborns are overrepresented only when recruitment is intimate or personal, and not when group appeals are made. In partial support of his hypothesis, he found, using group recruitment, no differences in birth order. There also appears to be evidence that gender may interact with birth order (see Rosenthal & Rosnow, 1975). Eisenman (1965) and Stein (1971) both found laterborns to be overrepresented as volunteers for studies involving stress. The later findings are consistent with Schachter's (1959) hypothesis that firstborns find pain or its prospect more aversive than do laterborns, based on data that firstborn females reported more fear of a prospective severe electric shock. Schachter's hypothesis is also supported by findings that firstborns participate less in dangerous sports as children (e.g., Nisbett, 1968; Yiannakis, 1976). Therefore, the present experiment was predicted to be less appealing to firstborns because of its hazardous nature.

Arousal Seeking

The prospect of being exposed to explosives should also be expected to appeal to the arousal-seeker (Schubert, 1964) or sensation-seeker (Zuckerman, Kolin, Price, & Zoob, 1964). Schubert found that volunteers reported more cigarette smoking, coffee drinking and use of caffeine pills, and contends that the use of central nervous system stimulants is a measure of arousal seeking. Zuckerman, Schultz, and Hopkins (1967), in three separate experiments, found that volunteers for hypnosis experiments scored significantly higher on the

Sensation Seeking Scale (SSS), and in two experiments that volunteers for sensory deprivation experiments scored higher on the SSS. Zuckerman (1979) presents other data demonstrating a relationship between high scores on subscales of the SSS and volunteering for hypnosis, sleep research, extrasensory perception research, and drug studies. Zuckerman contends that risk takers will volunteer for unusual experiments more than security-minded persons, and that individuals high in sensation seeking perceive a high-risk situation as lower in risk and anticipate less anxiety than do individuals who are low in sensation seeking. This notion is supported by the literature which indicates that volunteers are higher in arousal seeking only for experiments involving stress, hypnosis, or sensory isolation (Rosenthal & Rosnow, 1975).

Locus of Control

Only MacDonald (1972) has investigated the relationship between locus of control and volunteering, and found no differences between volunteers and nonvolunteers for a psychological experiment using Rotter's (1966) Locus of Control Scale. Torrance and Ziller (Note 1) hold that risk takers early in their lives gain a feeling of power over their environment and, thus, in a hazardous situation, should be more internally controlled than nonvolunteers. It was, therefore, predicted that volunteers would score more internally in terms of locus of control.

Social Class

Volunteers are more likely to be higher in social class than nonvolunteers, when the criteria is the volunteer's own status, according to several studies (e.g., Robins, 1965; Stein, 1971; Zimmer, 1956). Zimmer, using Air Force officers and

enlisted men, found that the probability of responding to a questionnaire increased with higher rank. Similarly, Robins found professionals to be more likely to participate in survey research than nonprofessionals, and Stein found volunteers had higher incomes. Conversely, volunteers' parents tend to have less education (Edwards, 1968; Reuss, 1943) and lower incomes (Rosen, 1951), although the differences are small and contradictory results have been found (e.g., Fischer & Winer, 1959). Therefore, volunteers were predicted to be higher in occupational status (i.e., military rank), yet more likely from a lower socioeconomic class (i.e., father's occupation and parents' education).

Other Variables

Many studies have shown when college student populations are not used, that volunteers are better educated than nonvolunteers (e.g., Reuss, 1943; Stein, 1971; Zimmer, 1956). Therefore, volunteers were predicted to be better educated than nonvolunteers.

Regarding age, many studies have found volunteers to be younger (e.g., Myers et al., 1966; Rosen, 1951), although others reported volunteers to be older (e.g., Zimmer, 1956), or reported no differences (e.g., Stein, 1971). However, for many of the studies showing volunteers to be older, age is confounded with higher status (see Rosenthal & Rosnow, 1975). In the present study, volunteers were predicted to be younger.

Studies in survey research show volunteers to be from smaller towns (e.g., Reuss, 1943); whereas, other types of studies have found no differences (e.g., MacDonald, 1972; Rosen, 1951). Therefore, no differences were predicted in terms of town of origin.

Using military subjects, Myers et al. (1966) found volunteers to be higher in combat aptitude. Therefore, volunteers in the present study were predicted to be higher in combat aptitude.

The variables considered above as potential predictors of volunteering are considered to fall within two categories: those that appear to be related to the approach or avoidance of hazardous situations (e.g., risk taking, anxiety, arousal seeking, birth order, and locus of control) and those that appear to be related to volunteering in general (e.g., social class, education, age, and geographic origin).

Method

Subjects

The subjects were 60 male enlisted men from C Company, 2nd Battalion, 31st Infantry, 7th Infantry Division, Fort Ord, CA. The unit was tasked to provide a pool of men from which volunteers could be requested. Sixty men were present for the briefing, of which only one failed to fill out the questionnaires. Nine subjects were dropped due to the discovery that they would not be available to participate in the experiment for which volunteers were being solicited. By regulation, no inducements were offered to encourage participation.

A series of tests and questionnaires was administered to assess characteristics specifically related to volunteer status. A biographical questionnaire obtained information on age, rank, birth order, smoking habits, and coffee-drinking habits, as well as education level, parents' education father's occupation, and urban or rural upbringing.

Personality profiles were assessed by the IPAT Anxiety Scale (Cattell, 1957), and Rotter's Locus of Control Scale (Rotter, 1966). Risk-taking tendencies were measured using the Revised Life Experience Inventory adapted

from Torrance and Ziller (Note 1). Combat aptitude (CO) scores were also obtained from the Army Classification Battery scores.

Procedure

The men were seated in a classroom and were told that they would be taking a series of personality tests, opinion surveys, and biographical questionnaires. They were told that the testing was part of an experiment about which they would be told more after the testing. The tests and questionnaires were then administered, followed by a thorough briefing on the research project in which they were being asked to participate:

During this experiment you will be asked to play the role of an antitank gunner. You will be positioned in an open foxhole. Your task is to track and score "kills" on a threat tank traveling across your field of view. At the same time you will try to avoid being "killed" by the threat artillery supporting the tanks. The threat artillery will be simulated by live dynamite charges which will be detonated at various distances from your foxhole. The dynamite charges will be equivalent to 60mm and 81mm mortar shells and 105 and 155mm howitzer ordnance. For your protection you will be wearing a steel pot, flak vest, and earplugs. The noise level of the dynamite will be within safe limits, if your earplugs are inserted properly. You will receive points for each "kill" of the tank and lose points each time you are "killed" by the artillery which will be determined by a computer.

After the call for volunteers was made, all questions were answered. Thirty-eight of the fifty remaining men volunteered for the study. At this point, the nonvolunteers were interviewed to assess the reasons for nonvolunteering.¹ All volunteers signed participation agreements documenting informed consent.

The volunteers were then interviewed to assess their reasons for volunteering, their psychological stability for participation, and to insure that they were not coerced into volunteering.

Results

INSERT TABLE 1 ABOUT HERE

Data from personality tests and combat aptitude scores from Experiment 1 are shown in Table 1. As can be seen, volunteers were more risk taking ($p < .01$), consistent with predictions supporting Torrance and Ziller's (Note 1) risk-taking hypothesis. Consistent with this result, Navy divers (Biersner, 1971), sports parachutists (Fenz & Brown, 1968), and jet pilots (Fry & Reinhart, 1969) have all been found to score higher on risk-taking measures. Thus, risk takers are more likely to engage in dangerous occupations and other activities, possibly because they are self-confident and physically adequate.

Volunteers were less anxious than nonvolunteers ($p < .01$), consistent with predictions and Rosenthal and Rosnow's (1969, 1975) hypothesis that more threatening experiments will draw the volunteer with low anxiety levels. Individuals who are higher in anxiety level presumably are more anxious about the social consequences (both real and perceived) of decisions not to volunteer. However, if the experimental task is threatening, it may result in more fear than the feared consequences of not volunteering, so they decide not to volunteer.

Contrary to predictions, locus of control was not a significant variable; volunteers were not more internally controlled than nonvolunteers, consistent with results of MacDonald (1972). Volunteers were predicted to be higher in

combat aptitude - however, no differences were found. Myers et al. (1966) found differences in combat aptitude, but used a different measure of combat aptitude which is no longer used and, therefore, not available.

INSERT TABLE 2 ABOUT HERE

Behavioral and social frequency data from Experiment 1 are shown in Table 2. As predicted, laterborns were overrepresented among volunteers. This result may be considered surprising to some, given that the firstborn is often overrepresented (e.g., Capra & Dittes, 1962). However, using group recruitment, MacDonald (1972) found no differences, and both Eiseman (1965) and Stein (1971) found laterborns to be overrepresented for stressful experiments. Additionally, the dangerousness of Experiment 1 supports Schachter's (1959) contention that firstborns find pain or the prospect of pain more aversive than do laterborns and, therefore, avoid activities where the prospect of physical injury is great. The present finding is also in agreement with the result that firstborns react with more fear to the threat of physical harm in terms of both a hazardous diving situation (Radloff & Helmreich, 1969) and an unpleasant electric shock (Nisbett & Schachter, 1966), and also consistent with the oft-found observation that firstborns participate less in dangerous sports (e.g., Nisbett, 1968; Yiannakis, 1976).

Smokers were overrepresented among volunteers ($p < .05$), consistent with predictions, although there were no differences in coffee drinking. This result partially replicates Schubert (1964). In addition, smokers were overrepresented among volunteers who said they volunteered because the experiment sounded exciting, or wanted to test their personal reactions ($p < .025$). This finding,

together with the high arousal nature of the experiment, lends to the hypothesis that smoking is a measure of arousal seeking because of its nature as a CNS stimulant. It also supports Zuckerman's (1979) contention that high-sensation seekers volunteer more for risky experiments.

Noncommissioned officers were overrepresented among volunteers ($p < .05$), and volunteers were less likely to have fathers with high status occupations ($p < .05$). In addition, there was a marginal trend that volunteers were less likely to have fathers ($p < .10$) or mothers ($p < .10$) who attended college. These results are consistent with predictions and other research showing volunteers to be higher in rank (Zimmer, 1956) and to have parents with less education (Edwards, 1968; Reuss, 1943) and lower income (Rosen, 1951). These seemingly contrary findings support Rosenthal and Rosnow's (1969) contention that occupants of higher status roles are most likely to volunteer because their backgrounds include greater vertical social mobility.

Age and education were nonsignificant variables, contrary to the hypothesis, although the variance for each was extremely small. Geographic origin was also a nonsignificant variable.

A multiple-regression analysis was performed to determine the unique contribution of each variable to the total variance, presented in Tables 1 and 2 as R . Results indicated that anxiety, risk-taking, mother's education, smoking, geographic origin, and rank combined to account for 40% of the variance. Intercorrelations are presented in Table 3. Birth order does not account for a great deal of variance because it correlates with anxiety ($-.19$) and military rank ($+.25$).

INSERT TABLE 3 ABOUT HERE

Likewise, father's social class was not a significant variable in the regression analysis because it correlates with risk taking (-.19), smoking (+.23) and military rank (-.28).

EXPERIMENT 2

The purpose of Experiment 2 was to determine whether the results obtained in Experiment 1 would be replicated by requesting a similar sample of military subjects to volunteer for a dull, routine psychological experiment, in which risk was not involved.

In Experiment 1 it was hypothesized that volunteers were more risk taking, less anxious, higher in arousal seeking, and more likely to be laterborn because of the hazardous nature of the study. It was also hypothesized that the differences obtained in rank and socioeconomic class of parents were unrelated to the nature of the experiment.

Therefore, in Experiment 2, it was predicted that volunteers would be no higher in risk taking than nonvolunteers, that volunteers would be no less anxious, and perhaps higher in anxiety, and that there would be no differences between volunteers and nonvolunteers in terms of arousal seeking. No differences were predicted in birth order because group recruitment was used, and no differences were predicted in locus of control. As in Experiment 1, volunteers were predicted to be higher in rank, have parents with less education, and lower in social class.

Method

Subjects

The subjects were 72 male enlisted men from the 39th Engineers, Fort Devens, MA. The unit was asked to provide a pool of men from which volunteers could be requested. Seventy-two men were present for the briefing, of which only three failed to fill out the Questionnaires. By regulation, no inducements were offered to encourage participation.

The test and questionnaires were the same as those used in Experiment 1.

Procedure

The men were seated in a theater and were told that they would be taking a series of personality tests, opinion surveys, and biographical questionnaires. They were told that the testing was part of an experiment about which they would be told more after the testing.

The tests and questionnaires were then administered, followed by a thorough briefing on the research project in which they were being asked to participate: This is a psychological experiment in which you will be asked to complete several personality instruments. These instruments are not of the paper and pencil type that you just took. This experiment will require one afternoon of duty time.

After the call for volunteers was made, all questions were answered. Twenty-eight of the 69 remaining men volunteered for the study.

INSERT TABLE 4 ABOUT HERE

Results

Data from personality tests for Experiment 2 are shown in Table 4. As can be seen, there were no differences between volunteers and nonvolunteers in anxiety consistent with results of others (e.g., Zuckerman, et al. 1967). Indeed, the majority of volunteering studies measuring anxiety report no differences (see Rosenthal & Rosnow, 1975), as no predicted differences were found between volunteers and nonvolunteers on risk taking as on locus of control, the latter result being consistent with results of MacDonald (1972) and Experiment 1.

INSERT TABLE 5 HERE

Behavioral and social frequency data for Experiment 2 are shown in Table 5. As predicted, no differences were obtained in arousal seeking as measured by smoking and coffee drinking, consistent with other studies (e.g., MacDonald, 1972; Myers et al., 1966; Rosen, 1951), and Rosenthal and Rosnow's (1975) conclusion that volunteers are higher in arousal seeking for experiments involving stress, hypnosis, or sensory isolation, but not for ordinary studies. Consistent with results of MacDonald (1972), no differences were found in birth order, supporting MacDonald's contention that firstborns are not overrepresented when group recruitment is used.

No differences were found in rank or social class, although the differences were in the predicted direction. However, contrary to predictions, there were no differences in fathers' education level; and volunteers were more likely to have mothers who attended college ($p < .01$), the latter result consistent with Fischer & Winer (1969), but contrary to Experiment 1 and other studies (Edwards, 1968; Reuss, 1943).

A multiple regression analysis was performed to determine the unique contribution of each variable to the total variance (presented in Tables 4 and 5 as R). Results indicated that mothers' education level, coffee drinking, locus of control, and rank all combined to account for 21% of the variance. It is apparent from Tables 3 and 4, however, that by far mother's education accounted for the largest amount of variance (16% out of 21%).

INSERT TABLE 6 ABOUT HERE

GENERAL DISCUSSION

As hypothesized, volunteers for an experiment involving personal risk (Experiment 1) were significantly more risk taking, less anxious, and more arousal seeking than nonvolunteers. Volunteers were also more likely to be noncommissioned officers, more likely laterborns, more likely from a lower social class family, and more likely to have parents who attended college. The results are in agreement with previous research involving stress or novel situations and hypotheses concerning the traits of volunteers for such research.

The results of Experiment 2 supported the hypothesis that the differences found in Experiment 1 were the result of the hazardous nature of the study. Experiment 2 utilized a riskless, routine psychological experiment. Mother's education was the only significant variable in the second study.

Although significant differences were found between volunteer and nonvolunteer subjects, the differences in many instances were small. The results are in agreement with some findings and present new data in several instances,

and supports the notion that most discrepancies between studies are probably attributable to variables such as type of experiment, type of subject, and method of recruitment. Experiment 1 involved a risky experiment, male military subjects, and group recruitment; and Experiment 2 involved a riskless, psychological experiment, male military subjects, and group recruitment.

It was not unexpected that the results of the largest magnitude from Experiment 1 were related to the most salient feature of that experiment from the perspective of the potential volunteers, i.e., its perceived dangerousness. This is likely the reason that risk takers, low anxious, arousal seekers, and laterborns found their way into the subject pool. These results suggest the possibility that the inconsistent and somewhat ambiguous results of volunteer studies may be made more consistent by largescale studies investigating some of these boundary conditions.

Reference Note

1. Torrance, E. P., & Ziller, R. C. Risk and life experience: Development of a scale for measuring risk-taking tendencies (Research Report AFPTRC-TN-57-23). Randolph Air Force Base, San Antonio, TX: Crew Research Laboratory, Air Force Personnel and Training Research Center, February 1957.

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Footnotes

Jared B. Jobe is now at the US Army Research Institute of Environmental Medicine, Natick, MA 01760.

Portions of this experiment were presented at the American Psychological Association Annual Meeting, September 1979.

The views of the authors do not purport to reflect the positions of the Department of the Army or Department of Defense.

The authors would like to express their appreciation to the men of C Company, 2nd Battalion, 31st Infantry, 7th Infantry Division, Fort Ord, CA, for serving as subjects of this experiment.

¹The reasons individuals declined to volunteer supported the hypothesis that the study was at least perceived as being hazardous. Several people declined to volunteer because they thought it was too dangerous. Others stated that they did not like loud noises (perceived hazard), that they weren't interested, or they didn't have a combat-type military occupational specialty.

Table 1
Raw Scale Score Means for Volunteers and Nonvolunteers

Variable	Volunteers		Nonvolunteers		<u>df</u>	<u>t</u>	<u>r</u>	<u>R</u>
	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>				
Anxiety	32.54	8.50	40.73	10.58	46	-2.65*	.36	.12
Risk taking	16.45	3.72	13.00	5.10	48	2.55*	.35	.08
Locus of control	11.24	2.67	10.36	3.88	47	.86	.14	.02
Combat aptitude	99.58	10.24	100.83	6.65	48	-.40	.06	.01

* $p < .01$

Table 2
Frequency Data for Volunteers and Nonvolunteers

Variable	% Volunteers	% Nonvolunteers	$\chi^2(1)$	<u>r</u>	<u>R</u>
Smoking	70	42	3.19**	.25	.04
Coffee drinking	37	42	0.09	.04	.00
Noncommissioned officers	63	33	3.29**	.26	.06
Laterborn	79	50	3.79**	.28	.02
Lower social class father	81	50	3.85**	.30	.02
Father attended college	22	42	1.72*	.19	.03
Mother attended college	15	33	1.82*	.20	.07
Rural background	55	75	1.48	.14	.06
Age (Over 21)	39	50	0.41	.09	.02
Finished high school	79	67	0.75	.12	.01

* $p < .10$

** $p < .05$

TABLE 3

CORRELATION MATRIX

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Table 4
Raw Scale Score Means for Volunteers and Nonvolunteers

Variable	Volunteers		Nonvolunteers		<u>df</u>	<u>t</u>	<u>r</u>	<u>R</u>
	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>				
Anxiety	34.89	8.92	35.76	9.69	67	0.37	.05	.00
Risk taking	14.79	3.69	14.71	4.50	67	0.08	.03	.00
Locus of control	11.20	3.74	12.17	4.30	67	0.97	.12	.03

Table 5
Frequency Data for Volunteers and Nonvolunteers

Variable	% Volunteers	% Nonvolunteers	X ² (1)	<u>r</u>	<u>R</u>
Smoking	61	54	0.34	.07	.00
Coffee drinking	68	49	2.46	.19	.03
Noncommissioned officers	75	59	1.99	.17	.02
Laterborn	82	73	0.75	.10	.02
Lower social class father	50	34	1.73	.16	.00
Father attended college	25	15	1.17	.13	.00
Mother attended college	32	05	9.23*	.37	.13

*p < .01

TABLE 6

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER M31/82	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Army male enlisted personnel were tested in two experiments to assess the psycho- logical correlates of volunteering for a hazardous experiment, (Experiment 1) and a riskless, psychological experiment (Experiment 2). Subjects were given a biographical and personal habit questionnaire, IPAT Anxiety Scale, Rotter's Locus of Control Scale, and Torrance and Ziller's Life Experience Inventory. Results from Experiment 1 indicated that volunteers were significantly less anxious ($p < .01$), and more willing to take risks ($p < .01$) than were nonvolunteers. (over)		

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Noncommissioned officers ($p < .05$), smokers ($p < .05$), laterborn children ($p < .05$), and children of lower socioeconomic class parents ($p < .05$) were significantly overrepresented among the volunteers, and the hazardous nature of the experiment appears to have determined their characteristics. In Experiment 2, the only finding was that children of mothers who had attended college ($p < .01$) were overrepresented. Results are in agreement with findings, using college students, that volunteer samples differ significantly from nonvolunteer samples, and that results vary as a function of situational variables. The study indicates that the generalizability of experimental results have important limitations.

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